

**SHD Oil & Gas, LLC**

**Application for New True Minor Oil and Natural Gas  
Source**

**Old 7 Inch CTB**

**McLean County, North Dakota**

**August 2019**

**Prepared by:**



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**Attachment A.**  
**Federal Minor New Source Review Forms**



**UNITED STATES ENVIRONMENTAL PROTECTION AGENCY  
FEDERAL MINOR NEW SOURCE REVIEW PROGRAM IN INDIAN  
COUNTRY**

**40 CFR 49.151**

**Application for New Construction**

(Form NEW)

**Please check all that apply to show how you are using this form:**

☒ **Proposed Construction of a New Source**

☐ **Proposed Construction of New Equipment at an Existing Source**

☐ **Proposed Modification of an Existing Source**

☐ **Other – Please Explain**

**Use of this information request form is voluntary and not approved by the Office of Management and Budget.** The following is a check list of the type of information that Region 8 will use to process information on your proposed project. While submittal of this form is not required, it does offer details on the information we will use to complete your requested approval and providing the information requested may help expedite the process. An application form approved by the Office of Management and Budget can be found online at [https://www.epa.gov/sites/production/files/2015-12/documents/new\\_source\\_general\\_application\\_rev2017.pdf](https://www.epa.gov/sites/production/files/2015-12/documents/new_source_general_application_rev2017.pdf).

**Please submit information to following two entities:**

Federal Minor NSR Permit Coordinator  
U.S. EPA, Region 8  
1595 Wynkoop Street, 8P-AR  
Denver, CO 80202-1129  
[R8airpermitting@epa.gov](mailto:R8airpermitting@epa.gov)

For more information, visit:  
<http://www.epa.gov/caa-permitting/tribal-nsr-permitting-region-8>

The Tribal Environmental Contact for the specific reservation:

If you need assistance in identifying the appropriate Tribal Environmental Contact and address, please contact:  
[R8airpermitting@epa.gov](mailto:R8airpermitting@epa.gov)

**A. GENERAL SOURCE INFORMATION**

1. (a) <b>Company Name</b> (Who owns this facility?) <b>SHD Oil &amp; Gas, LLC</b>		2. <b>Facility Name</b> <b>Old 7 Inch CTB</b>	
(b) <b>Operator Name</b> (Is the company that operates this facility different than the company that owns this facility? What is the name of the company?)		<b>API Numbers</b> <b>3305500172</b>	
3. Type of Operation <b>Oil and gas production</b>		4. Portable Source?      Yes    X No	
		5. Temporary Source?    Yes    X No	
6. NAICS Code <b>211120</b>		7. SIC Code <b>1311</b>	
8. Physical Address (Or, home base for portable sources) <b>NA</b>			
9. Reservation* <b>Fort Berthold Reservation</b>	10. County* <b>McLean County, ND</b>	11a. Latitude (decimal format)* <b>47.778061</b>	11b. Longitude (decimal format)* <b>-102.250606</b>
12a. Quarter Quarter Section* <b>SE/SW</b>	12b. Section* <b>30</b>	12c. Township* <b>150N</b>	12d. Range* <b>90W</b>

\*Provide all proposed locations of operation for portable sources

**B. PREVIOUS PERMIT ACTIONS** (Provide information in this format for each permit that has been issued to this source. Provide as an attachment if additional space is necessary)

Facility Name on the Permit
Permit Number (xx-xxx-xxxxx-xxxx.xx)
Date of the Permit Action

Facility Name on the Permit
Permit Number (xx-xxx-xxxxx-xxxx.xx)
Date of the Permit Action

Facility Name on the Permit
Permit Number (xx-xxx-xxxxx-xxxx.xx)
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Facility Name on the Permit
Permit Number (xx-xxx-xxxxx-xxxx.xx)
Date of the Permit Action

Facility Name on the Permit
Permit Number (xx-xxx-xxxxx-xxxx.xx)
Date of the Permit Action

### C. CONTACT INFORMATION

<b>Company Contact</b> (Who is the <u>primary</u> contact for the company that owns this facility?) <b>Randy Neset</b>		<b>Title</b> <b>Chief Operating Officer,</b> Spotted Hawk Development
Mailing Address <b>6844 Hwy 40, Tioga, ND 58852</b>		
Email Address <b>rneset@spotted-hawk.com</b>		
Telephone Number <b>701-641-0778</b>	Facsimile Number	
<b>Operator Contact</b> (Is the company that operates this facility different than the company that owns this facility? Who is the <u>primary</u> contact for the company that operates this facility?) <b>Randy Neset</b>		<b>Title</b> <b>Chief Operating Officer,</b> Spotted Hawk Development
Mailing Address <b>6844 Hwy 40, Tioga, ND 58852</b>		
Email Address <b>rneset@spotted-hawk.com</b>		
Telephone Number <b>701-641-0778</b>	Facsimile Number	
<b>Permitting Contact</b> (Who is the person <u>primarily</u> responsible for Clean Air Act permitting for the company? We are seeking one main contact for the company. Please do not list consultants.) <b>Randy Neset</b>		<b>Title</b> <b>Chief Operating Officer,</b> Spotted Hawk Development
Mailing Address <b>6844 Hwy 40, Tioga, ND 58852</b>		
Email Address <b>rneset@spotted-hawk.com</b>		
Telephone Number <b>701-641-0778</b>	Facsimile Number	
<b>Compliance Contact</b> (Is the person responsible for Clean Air Act compliance for this company different than the person responsible for Clean Air Act permitting? Who is the person <u>primarily</u> responsible for Clean Air Act compliance for the company? We are seeking one main contact for the company. Please do not list consultants.) <b>Randy Neset</b>		<b>Title</b> <b>Chief Operating Officer,</b> Spotted Hawk Development
Mailing Address <b>6844 Hwy 40, Tioga, ND 58852</b>		
Email Address <b>rneset@spotted-hawk.com</b>		
Telephone Number <b>701-641-0778</b>	Facsimile Number	

## D. ATTACHMENTS

**Include all of the following information** (see the attached instructions)

\*Please do not send Part 71 Operating Permit Application Forms in lieu of the check list below.

**FORM SYNMIN** - New Source Review Synthetic Minor Limit Request Form, if synthetic minor limits are being requested.

**X** Narrative description of the proposed production processes. This description should follow the flow of the process flow diagram to be submitted with this application.

**X** Process flow chart identifying all proposed processing, combustion, handling, storage, and emission control equipment.

**X** A list and descriptions of all proposed emission units and air pollution-generating activities.

**X** Type and quantity of fuels, including sulfur content of fuels, proposed to be used on a daily, annual and maximum hourly basis.

**X** Type and quantity of raw materials used or final product produced proposed to be used on a daily, annual and maximum hourly basis.

**X** Proposed operating schedule, including number of hours per day, number of days per week and number of weeks per year.

**X** A list and description of all proposed emission controls, control efficiencies, emission limits, and monitoring for each emission unit and air pollution generating activity.

**X Criteria Pollutant Emissions** - Estimates of Current Actual Emissions, Current Allowable Emissions, Post-Change Uncontrolled Emissions, and Post-Change Allowable Emissions for the following air pollutants: particulate matter, PM<sub>10</sub>, PM<sub>2.5</sub>, sulfur oxides (SO<sub>x</sub>), nitrogen oxides (NO<sub>x</sub>), carbon monoxide (CO), volatile organic compound (VOC), lead (Pb) and lead compounds, fluorides (gaseous and particulate), sulfuric acid mist (H<sub>2</sub>SO<sub>4</sub>), hydrogen sulfide (H<sub>2</sub>S), total reduced sulfur (TRS) and reduced sulfur compounds, including all calculations for the estimates.

These estimates are to be made for each emission unit, emission generating activity, and the project/source in total. Note, there are no insignificant emission units or activities in this permitting program, only exempted units and activities. Please see the regulation for a list of exempted units and activities.

**X Air Quality Review**

**X ESA (Endangered Species Act)**

**X NHPA (National Historic Preservation Act)**

## E. TABLE OF ESTIMATED EMISSIONS

The following tables provide the total emissions in tons/year for all pollutants from the calculations required in Section D of this form, as appropriate for the use specified at the top of the form.

### E(i) – Proposed New Source

Pollutant	Potential Emissions (tpy)	Proposed Allowable Emissions (tpy)	
PM	0.42	0.42	PM - Particulate Matter PM <sub>10</sub> - Particulate Matter less than 10 microns in size PM <sub>2.5</sub> - Particulate Matter less than 2.5 microns in size SO <sub>2</sub> - Sulfur Dioxide NO <sub>x</sub> - Nitrogen Oxides CO - Carbon Monoxide VOC - Volatile Organic Compound Pb - Lead and lead compounds Fluorides - Gaseous and particulates H <sub>2</sub> SO <sub>4</sub> - Sulfuric Acid Mist H <sub>2</sub> S - Hydrogen Sulfide TRS - Total Reduced Sulfur RSC - Reduced Sulfur Compounds
PM <sub>10</sub>	0.42	0.42	
PM <sub>2.5</sub>	0.42	0.42	
SO <sub>2</sub>	0.03	0.03	
NO <sub>x</sub>	7.17	7.17	
CO	11.76	11.76	
VOC	22.41	22.41	
Pb	0.00	0.00	
Fluorides	0.00	0.00	
H <sub>2</sub> SO <sub>4</sub>	0.00	0.00	
H <sub>2</sub> S	0.00	0.00	
TRS	0.00	0.00	
RSC	0.00	0.00	

Emissions calculations must include fugitive emissions if the source is one the following listed sources, pursuant to CAA Section 302(j):

- (a) Coal cleaning plants (with thermal dryers);
- (b) Kraft pulp mills;
- (c) Portland cement plants;
- (d) Primary zinc smelters;
- (e) Iron and steel mills;
- (f) Primary aluminum ore reduction plants;
- (g) Primary copper smelters;
- (h) Municipal incinerators capable of charging more than 250 tons of refuse per day;
- (i) Hydrofluoric, sulfuric, or nitric acid plants;
- (j) Petroleum refineries;
- (k) Lime plants;
- (l) Phosphate rock processing plants;
- (m) Coke oven batteries;
- (n) Sulfur recovery plants;
- (o) Carbon black plants (furnace process);
- (p) Primary lead smelters;
- (q) Fuel conversion plants;
- (r) Sintering plants;
- (s) Secondary metal production plants;
- (t) Chemical process plants
- (u) Fossil-fuel boilers (or combination thereof) totaling more than 250 million British thermal units per hour heat input;
- (v) Petroleum storage and transfer units with a total storage capacity exceeding 300,000 barrels;
- (w) Taconite ore processing plants;
- (x) Glass fiber processing plants;
- (y) Charcoal production plants;
- (z) Fossil fuel-fired steam electric plants of more than 250 million British thermal units per hour heat input, and
- (aa) Any other stationary source category which, as of August 7, 1980, is being regulated under section 111 or 112 of the Act.

**E(ii) – Proposed New Construction at an Existing Source or Modification of an Existing Source**

<b>Pollutant</b>	<b>Current Actual Emissions (tpy)</b>	<b>Current Allowable Emissions (tpy)</b>	<b>Post-Change Potential Emissions (tpy)</b>	<b>Post-Change Allowable Emissions (tpy)</b>
<b>PM</b>				
<b>PM<sub>10</sub></b>				
<b>PM<sub>2.5</sub></b>				
<b>SO<sub>2</sub></b>				
<b>NO<sub>x</sub></b>				
<b>CO</b>				
<b>VOC</b>				
<b>Pb</b>				
<b>Fluorides</b>				
<b>H<sub>2</sub>SO<sub>4</sub></b>				
<b>H<sub>2</sub>S</b>				
<b>TRS</b>				
<b>RSC</b>				

PM - Particulate Matter

PM<sub>10</sub> - Particulate Matter less than 10 microns in size

PM<sub>2.5</sub> - Particulate Matter less than 2.5 microns in size

SO<sub>2</sub> – Sulfur Dioxide

NO<sub>x</sub> - Nitrogen Oxides

CO - Carbon Monoxide

VOC - Volatile Organic Compound

Pb - Lead and lead compounds

Fluorides - Gaseous and particulates

H<sub>2</sub>SO<sub>4</sub> - Sulfuric Acid Mist

H<sub>2</sub>S - Hydrogen Sulfide

TRS - Total Reduced Sulfur

RSC - Reduced Sulfur Compounds

[Disclaimers] The public reporting and recordkeeping burden for this collection of information is estimated to average 20 hours per response, unless a modeling analysis is required. If a modeling analysis is required, the public reporting and recordkeeping burden for this collection of information is estimated to average 60 hours per response. Send comments on the Agency's need for this information, the accuracy of the provided burden estimates, and any suggested methods for minimizing respondent burden, including through the use of automated collection techniques to the Director, Collection Strategies Division, U.S. Environmental Protection Agency (2822T), 1200 Pennsylvania Ave., NW, Washington, D.C. 20460. Include the OMB control number in any correspondence. Do not send the completed form to this address.

## **Attachment B. Process Information**

## Operations Description

The Old 7 Inch central tank battery (CTB) has one (1) well head that will produce to the facility, thirteen (13) 1.0 million British thermal units per hour (MMBtu/hr) heater treaters, ten (10) 1,000-bbl oil tanks, eight (8) 400-bbl oil tanks, ten (10) 1,000-bbl produced water tanks, eight (8) 400-bbl produced water tanks, six (6) open flares for tank gas control, and twelve (12) open flares to be used only for emergency situations. Please note that production equipment associated with the addition of more wells to this facility is included in this application, in order to account for future plans. A permit modification will be submitted before any additional wells are added to the Old 7 Inch CTB.

Hydrocarbons are pumped from the wellhead and routed to the heater treaters. At the heater treaters, gas, oil, and produced water are separated. Produced gas is routed to a sales gas gathering line. Oil is routed to the vapor recovery tower where pressure is lowered to a level where stable oil is routed to the oil tanks. The gas from the vapor recovery towers is routed to the gas gathering line. Produced water is routed to the produced water tanks. Vapors off of the oil and produced water tanks are routed to the flares with a minimum 98% destruction efficiency. Oil is piped offsite and produced water is transported offsite using haul trucks, as needed. Fugitive emissions also occur from component leaks.

A depiction of the process flow described above is included at the end of Attachment B.

## Air Pollutant Sources

The following types of emissions sources are present and operational on the Old 7 Inch CTB and were evaluated as part of this application. Criteria pollutants evaluated for the Old 7 Inch CTB include nitrogen oxides (NO<sub>x</sub>), carbon monoxide (CO), volatile organic compounds (VOCs), particulate matter less than 10 micrometers in diameter (PM<sub>10</sub>), particulate matter less than 2.5 micrometers in diameter (PM<sub>2.5</sub>), and sulfur dioxide (SO<sub>2</sub>). Hazardous air pollutants (HAPs) and greenhouse gas pollutants (GHG) were also evaluated. Evaluated GHG pollutants were carbon dioxide (CO<sub>2</sub>), methane (CH<sub>4</sub>), and nitrous oxide (N<sub>2</sub>O). Pollutants associated with each source are listed below.

### 1. Heater treater burners

- ∞ These external combustion devices are powered by sweet onsite fuel gas and are used in the initial separation and liquid heating processes, respectively.

- ∞ Pollutants emitted: NO<sub>x</sub>, CO, VOCs, PM<sub>10</sub>, PM<sub>2.5</sub>, SO<sub>2</sub>, HAPs, GHG.
2. Oil and produced water storage tanks and their dedicated flares
    - ∞ Atmospheric storage tanks are used to hold oil and produced water that is produced on location.
    - ∞ The vapors off of the storage tanks are routed to open flares where combustion occurs with a 98% destruction efficiency of hydrocarbons.
    - ∞ Pollutants emitted: NO<sub>x</sub>, CO, VOCs, PM<sub>10</sub>, PM<sub>2.5</sub>, SO<sub>2</sub>, HAPs, GHG.
  3. Production water truck loadout
    - ∞ Haul trucks are used to transport produced water off location. Emissions result from the process of loading produced water into the haul trucks.
    - ∞ Pollutants emitted: VOCs, HAPs, GHG.
  4. Fugitive emissions from component leaks
    - ∞ This source accounts for equipment leaks from valves, flanges, connectors, and other types of emissions sources in gas and light oil service.
    - ∞ Pollutants emitted: VOCs, HAPs, GHG.

### Air Pollution Control Equipment

1. Oil and produced water storage tanks – Flares
  - ∞ The flares are add-on control devices for the oil and produced water storage tanks to reduce hydrocarbon emissions.
  - ∞ The flares meets a minimum destruction efficiency of 98%. The flares reduces the potential to emit of the oil and produced water storage tanks by 98% of hydrocarbons such as VOCs and HAPs (that are also VOCs), and GHGs in the form of methane.
  - ∞ The flares are monitored continuously by a thermocouple. Monitoring, recordkeeping, and reporting procedures for the oil storage tanks, produced water storage tanks, and flares are discussed in Attachment E.

### Fuel Usage

The following table outlines the estimated amount of field gas that is combusted by process equipment. The process equipment is fueled by sweet onsite fuel gas. The representative gas analysis used in the emission calculations in Attachment C shows no detectable hydrogen sulfide (H<sub>2</sub>S) in the gas.

Source	Hourly Fuel Use	Daily Fuel Use	Annual Fuel Use
Heater treaters	13.0 MMBtu/hr	312 MMBtu/day	113,880 MMBtu/yr
Flares for storage tank control	1,472 scf/hr	35.3 Mscf/day	12.9 MMscf/yr

### Raw Materials

No raw materials are used in the extraction of natural gas and petroleum liquids.

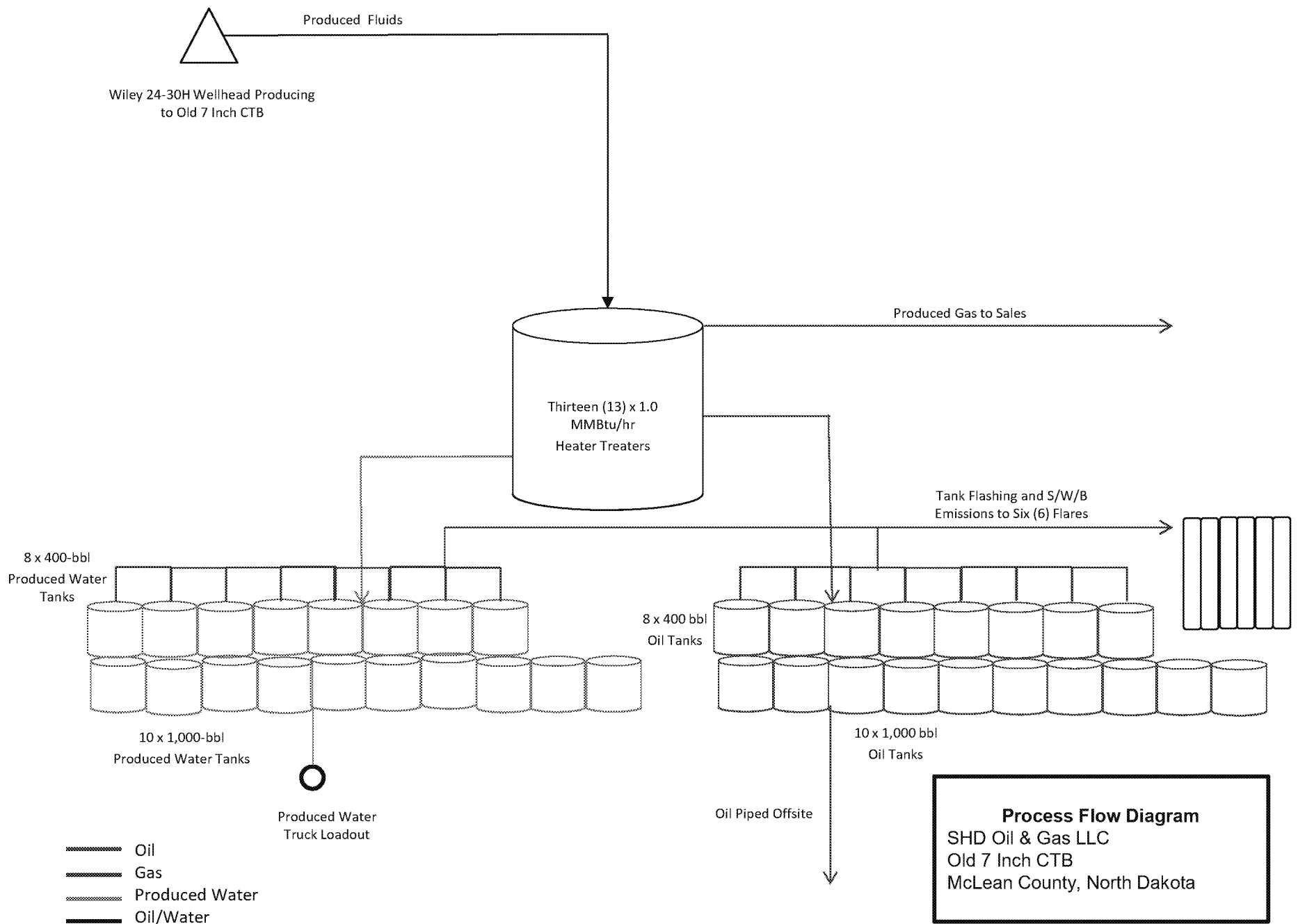
### Operating Schedule

All emission sources at the Old 7 Inch CTB are typically run for the entire calendar year; 24 hours per day and 365 days per year. Equipment is shut down only if maintenance is required.

### Production Rates

Estimated annual production used in the emission calculations of Attachment C is based on a production curve for the lifespan of each well that produces to the Old 7 Inch CTB. The total production was taken from the highest oil producing 12-month period. The production values used in the emission calculations are:

- ∞ Oil production: 905 barrels per day
- ∞ Natural gas production: 582 Mscf/day
- ∞ Produced water production: 389 barrels per day



## **Attachment C. Emission Calculations**

## TOTAL EMISSIONS SUMMARY

Company:	SHD Oil & Gas, LLC
Facility Name:	Old 7 Inch CTB
Facility Location:	McLean County, North Dakota

## CONTROLLED POTENTIAL EMISSIONS SUMMARY

Source	NO <sub>x</sub>		CO		VOC		PM <sub>10</sub> /PM <sub>2.5</sub>		SO <sub>2</sub>		HAPs		CO <sub>2</sub> e	
	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr
Condensate Tanks (TK-001 - TK-018)	---	---	---	---	4.96	21.70	---	---	---	---	0.60	2.64	1.76	7.73
Produced Water Tanks (PW-001 - PW-018)	---	---	---	---	0.029	0.13	---	---	---	---	0.0036	0.016	0.0079	0.034
Tank Flares (FL-001 - FL-006)	0.36	1.58	1.61	7.07	0.00049	0.0022	---	---	---	---	---	---	619.2	2,712
Fugitive Emissions (FUG-001)	---	---	---	---	0.052	0.228	---	---	---	---	---	---	0.34	1.47
Truck Loading (TL-001)	---	---	---	---	---	0.047	---	---	---	---	---	0.00636	---	0.013
Heater Treater (HT-001 - HT-013)	1.27	5.58	1.07	4.69	0.070	0.31	0.10	0.42	0.0076	0.033	0.024	0.10	1,526	6,684
<b>TOTAL =</b>	<b>1.64</b>	<b>7.17</b>	<b>2.68</b>	<b>11.76</b>	<b>5.11</b>	<b>22.41</b>	<b>0.10</b>	<b>0.42</b>	<b>0.0076</b>	<b>0.033</b>	<b>0.63</b>	<b>2.76</b>	<b>2,147</b>	<b>9,405</b>

## Oil Storage Tank Flashing Emissions

Company:	SHD Oil & Gas, LLC
Facility Name:	Old 7 Inch CTB
Facility Location:	McLean County, ND
Source Description:	Condensate Tank Flashing
Emission Unit ID:	TK-001 - TK-018

Maximum Average Daily Oil Production<sup>1</sup>: 905 bbl/day  
 Tank Gas-to-Oil Ratio<sup>2</sup>: 39 scf/bbl  
 Combustor Efficiency<sup>3</sup>: 98%

### Emissions Calculations

Component	Mole Percent (%) <sup>2</sup>	Molecular Weight (lb/lbmol)	Weight Percent (%) <sup>2</sup>	Uncontrolled Vent Gas Rate (scf/hr)	Controlled Flashing Emissions <sup>3</sup> (lb/hr)	Controlled Flashing Emissions <sup>3</sup> (tons/yr)
Methane	4.17	16.04	1.00	61.28	0.052	0.23
Ethane	7.97	30.07	3.60	117.13	0.19	0.81
Propane	19.86	44.10	13.15	292.12	0.68	2.97
i-Butane	5.65	58.13	4.93	83.06	0.25	1.11
n-Butane	15.31	58.12	13.36	225.10	0.69	3.02
i-Pentane	5.02	72.15	5.44	73.87	0.28	1.23
n-Pentane	9.15	72.15	9.91	134.56	0.51	2.24
Hexanes	5.30	86.18	6.85	77.88	0.35	1.55
Heptanes	6.56	100.2	9.87	96.46	0.51	2.23
Octanes	3.04	114.2	5.21	44.66	0.27	1.18
Nonanes	2.75	128.3	5.29	40.37	0.27	1.20
Decanes+	4.02	142.3	8.59	59.18	0.44	1.94
Benzene	1.52	78.11	1.78	22.32	0.092	0.40
Toluene	1.64	92.14	2.27	24.15	0.12	0.51
Ethylbenzene	0.72	106.2	1.15	10.60	0.059	0.26
Xylenes	1.72	106.2	2.74	25.26	0.14	0.62
n-Hexane	2.81	86.18	3.64	41.32	0.19	0.82
Nitrogen	2.55	28.01	1.07	37.47	2.77	12.11
Carbon Dioxide	0.26	44.01	0.17	3.82	0.44	1.94
<b>VOC Subtotal</b>	85.06		94.16	1,251	4.86	21.29
<b>HAP Subtotal</b>	8.41		11.57	123.7	0.60	2.62
<b>CO<sub>2</sub>e Subtotal<sup>4</sup></b>	---		---	---	1.74	7.62
<b>Total</b>	100.0		100.0	1,471	8.31	36.39

#### Notes:

1. Production is the maximum projected rolling 12-month production for the life of the well.
2. Flashing analysis is from analyses of a representative well.
3. Oil tanks are controlled by a flare with a destruction efficiency of 98% as required by federal regulations.
4. Global warming potentials, as of January 2015, were applied to methane (25) and carbon dioxide (1) to calculate GHG emissions.

# Oil Tank Working and Breathing Emissions

Company:	SHD Oil & Gas, LLC
Facility Name:	Old 7 Inch CTB
Facility Location:	McLean County, North Dakota
Source Description:	Condensate Tanks (TK-001 - TK-010)

## Tank Information

Tank ID:	Condensate Tanks (TK-001 - TK-010)		
No. of Tanks:	10		
Tank Capacity:	1000	bbls	
Total Tank Capacity:	10,000	bbls	

## Actual Emissions

### Production Data

Estimated Production:	18,351	bbl/yr-tank
Estimated Production:	50	bbl/day-tank

## Controlled Emissions<sup>1</sup>

Pollutant	Estimated Emissions	
	lb/hr	ton/yr
VOC	0.062	0.27
HAPS	0.0076	0.0333
CH <sub>4</sub> <sup>3</sup>	0.00066	0.0029
CO <sub>2</sub> e	0.017	0.07

- 1) Emissions are controlled with a flare with 98% destruction efficiency of hydrocarbons.
- 2) VOC and HAPs emissions were estimated using the weight % from the flash gas analysis.
- 3) Greenhouse gas emissions were calculated using the mass fractions from the flash gas analysis.

## **Sample Calculations**

Pollutant Emission Rate (tpy) = Estimated Production (gal/yr)/ 2000 (lb/ton)\*Total Pollutant Output\*Total Flare Amount\*No. Oil Tanks

Pollutant Emission Rate (tpy) = Estimated Production (gal/yr)/ 8760 (lb/ton)\*Total Pollutant Output\*Total Flare Amount\*No. Oil Tanks

# Oil Tank Working and Breathing Emissions

Company:	SHD Oil & Gas, LLC
Facility Name:	Old 7 Inch CTB
Facility Location:	McLean County, North Dakota
Source Description:	Condensate Tanks (TK-011 - TK-018)

## Tank Information

Tank ID:	Condensate Tanks (TK-001 - TK-010)		
No. of Tanks:	8		
Tank Capacity:	400	bbls	
Total Tank Capacity:	3,200	bbls	

## Actual Emissions

### Production Data

Estimated Production:	18,351	bbl/yr-tank
Estimated Production:	50	bbl/day-tank

## Controlled Emissions<sup>1</sup>

Pollutant	Estimated Emissions	
	lb/hr	ton/yr
VOC	0.033	0.13
HAPS	0.0041	0.018
CH <sub>4</sub>	0.00035	0.0015
CO <sub>2</sub> e	0.0089	0.039

- 1) Emissions are controlled with a flare with 98% destruction efficiency of hydrocarbons.
- 2) VOC and HAPs emissions were estimated using the weight % from the flash gas analysis.
- 3) Greenhouse gas emissions were calculated using the mass fractions from the flash gas analysis.

## Sample Calculations

Pollutant Emission Rate (tpy) = Estimated Production (gal/yr) / 2000 (lb/ton) \* Total Pollutant Output \* Total Flare Amount \* No. Oil Tanks

Pollutant Emission Rate (tpy) = Estimated Production (gal/yr) / 8760 (lb/ton) \* Total Pollutant Output \* Total Flare Amount \* No. Oil Tanks

# Produced Water Tank Emissions

Company:	SHD Oil & Gas, LLC
Facility Name:	Old 7 Inch CTB
Facility Location:	McLean County, North Dakota
Source Description:	Produced Water Tanks (PW-001 - PW-018)

## Tank Information

Tank ID: Produced Water Tanks (PW-001 - PW-018)  
 No. of Tanks: 18  
 Tank Capacity: 10 x 1000, 8 X 400 bbls  
 Total Tank Capacity: 13200 bbls

## Actual Emissions

### Production Data

Estimated Production: 7,891 bbl/yr-tank  
 Estimated Production: 22 bbl/day-tank

### Emission Factor<sup>1</sup>

EPA-450-3-85-001 Factor: 0.090 lb VOC/bbl

## Controlled Emissions<sup>2</sup>

Pollutant	Estimated Emissions	
	lb/hr	ton/yr
VOC	0.029	0.13
HAPS <sup>2</sup>	0.0036	0.016
CH <sub>4</sub> <sup>3</sup>	0.00031	0.0014
CO <sub>2</sub> e <sup>3</sup>	0.0079	0.034

1) Emissions are controlled with a flare with 98% destruction efficiency of hydrocarbons.

2) HAP emissions are estimated by the ratio of HAPs to VOCs from the condensate tanks.

3) Greenhouse gas emissions were calculated using the mass fractions from the flash gas analysis.

## Sample Calculations

Pollutant Emission Rate (tpy) = Estimated Production (bbl/yr) \* Emission Factor (lb/bbl) / 2000 (lb/ton)

Pollutant Emission Rate (lb/hr) = Estimated Production (bbl/yr) \* Emission Factor (lb/bbl) / 8,760 (hrs/yr)

Controlled Emission Rate (tpy) = Uncontrolled \*(1-0.98)

Emission Factor (lb/bbl) = Emission Factor (kg/m3) / 2.85 (kg/m3)

# Annual Truck Loading Emissions

Company:	SHD Oil & Gas, LLC
Facility Name:	Old 7 Inch CTB
Facility Location:	McLean County, North Dakota
Source Description:	Truck Loading (TL-001)

AP - 42, Chapter 5.2       $L_L = 12.46 \times S \times P \times M / T$

$L_L$  = Loading Loss Emission Factor (lbs VOC/1000 gal loaded)

S = Saturation Factor

P = True Vapor Pressure of the Loaded Liquid (psia)

M = Vapor Molecular Weight of the Loaded Liquid (lbs/lbmol)

T = Temperature of Loaded Liquid (°R)

$$\text{VOC Emissions (tpy)} = \frac{L_L (\text{lbs VOC}/1000 \text{ gal}) \times 42 \text{ gal/bbl} \times 365 \text{ days/year} \times \text{production (bbl/day)}}{1000 \text{ gal} \times 2000 \text{ lbs/ton}}$$

						Produced Water <sup>3</sup>					
Location	Factors	S	TVP (psi) <sup>1</sup>	M <sup>1</sup>	T (°R)	$L_L$ lb/1000 gal	Production bpd	VOC <sup>2</sup> tpy	HAPs tpy	CH <sub>4</sub> tpy	CO <sub>2</sub> e <sup>4</sup> tpy
Truck Loading	12.46	0.6	2.30	50	510	0.17	389	0.047	0.0064	0.00050	0.013

## Notes:

- 1) Vapor molecular weight and True Vapor Pressure (TVP) of the loaded liquid from AP-42 Chapter 7, Table 7.1-2, assuming the properties of Condensate RVP 5.
- 2) VOC emissions estimated from the weight percents from the flash gas analysis.
- 3) It is conservatively assumed the produced water will have no more than 10% hydrocarbon content. Oil is piped offsite
- 4) Greenhouse gas emissions were estimated using the weight fractions from the flash gas analysis.
- 5) HAP emissions are estimated from the weight percents from the flash gas analysis.

## Storage Tank Flaring Emissions

Company:	SHD Oil & Gas, LLC
Facility Name:	Old 7 Inch CTB
Location:	McLean County, North Dakota
Source Description	Flares for Storage Tanks

### Source Information

Unit ID	Tank Flares (FL-001 - FL-006)	
Source Description	Flare Pilot	
Hours of Operation	8,760	hr/yr
Fuel Consumption <sup>1</sup>	80	scf/hr
Estimated Fuel Heat Value	1,825	Btu/scf
Fuel Use	0.44	MMscf/yr

### Estimated Tank Emissions Information

Unit ID	Old 7 inch CTB	
Estimated Emissions Rate <sup>2,3</sup>	1.472	scf/hr
Vapor Molecular Weight <sup>4</sup>	80	lb/lb-mol
Waste Gas Heating Value <sup>5</sup>	3,522	Btu/scf
Tank Emissions Heat Input	5.18	MMBtu/hr

1) Conservative pilot flow

2) Flares will control the oil and produced water tanks

3) Emission rate is estimated using the oil and water tank emissions, assuming produced water contains 10% hydrocarbons.

4) Vapor molecular weight is based on EPA Tanks 4.0 report.

5) In accordance with AP-42, Chapter 1.4 guidance, the emissions factors are converted to the specified fuel heating value by multiplying the emission factor by the ratio of the specified heat value to the default heat value of 1,020 Btu/scf.

### Sample Calculations:

#### Pilot Emissions

$$\text{Fuel Consumption (MMscf/yr)} = \text{Pilot Fuel Consumption (scf/hr)} * 8,760 \text{ (hrs/yr)} * \text{MMscf} / 10^6 \text{ scf}$$

$$\text{Emissions (tons/yr)} = \text{AP-42 Emission Factor (lb/MMscf)} * \text{Fuel Consumption (MMscf/yr)} * 1 \text{ ton} / 2000 \text{ lbs} * \text{Estimated Fuel Heat Value (Btu/scf)} / \text{Default Fuel Heat Value (Btu/scf)}$$

#### Tank Emissions

$$\text{Tank Emissions Rate (scf/hr)} = \text{Tank Emissions (lb/hr)} * 379.49 \text{ scf/lbmol} / 50 \text{ lb/lb-mol}$$

$$\text{Flash Gas Heat Input (MMBtu/hr)} = \text{Tank Emissions Rate (scf/hr)} * \text{Estimated Flash Gas Heat Value (Btu/scf)} * 1 \text{ MMBtu} / 10^6 \text{ Btu}$$

$$\text{Emissions (tons/yr)} = \text{AP-42 Emission Factor (lbs/MMBtu)} * \text{Flash Gas Heat Input (MMBtu/hr)} * 1 \text{ ton} / 2000 \text{ lbs}$$

### Emission Calculations - Pilot Burner

Pollutant	Emission Factor (lb/MMscf)	Estimated Emissions (tpy) <sup>6</sup>	Emission Factor Source
NO <sub>x</sub>	100.0	0.039	AP-42 Ch. 1.4 Table 1.4-1
CO	84.0	0.033	AP-42 Ch. 1.4 Table 1.4-1
VOC	5.50	0.0022	AP-42 Ch. 1.4 Table 1.4-2
SO <sub>2</sub>	0.60	0.00024	AP-42 Ch. 1.4 Table 1.4-2

### Tank Waste Stream Emissions

Pollutant	Emission Factor (lb/MMBtu)	Estimated Emissions (tpy)	Emission Factor Source
NO <sub>x</sub>	0.068	1.54	AP-42, Ch. 13.5, Table 13.5.1
CO	0.31	7.04	AP-42, Ch. 13.5, Table 13.5.1

### Total Potential Combustor Emissions

Pollutant	Estimated Emissions (lb/hr)	(tpy)
NO <sub>x</sub>	0.36	1.58
CO	1.61	7.07
VOC	0.00049	0.0022

### Greenhouse Gas Emissions

Pollutant	Emission Factor (kg/MMBtu)	Emissions (lb/hr)	Emissions (tpy)	Emission Factor Source
Carbon Dioxide	53.06	618.5	2,709	40 CFR Part 98, Subpart C, Table C-1
Methane	0.001	0.012	0.051	40 CFR Part 98, Subpart C, Table C-2
Nitrogen Dioxide	0.0001	0.0012	0.0051	40 CFR Part 98, Subpart C, Table C-2
CO <sub>2</sub> e	----	619.2	2,712	40 CFR Part 98, Subpart A, Table A-1

# Fugitive Leak Emissions

Company:	SHD Oil & Gas, LLC
Facility Name:	Old 7 Inch CTB
Location:	McLean County, North Dakota
Source Description	Fugitive Emissions (FUG-001)

Equipment Type and Service	No. of Units	Hours of Operation (hrs/yr)	VOC Weight Fraction <sup>1</sup>	Emission Factor <sup>2</sup> (kg/hr-unit)	VOC Emissions (lb/hr)	VOC Emissions (tons/yr)
Valves - Gas	371	8,760	0.63	2.50E-05	0.0128	0.056
Valves - Light Oil	62	8,760	0.95	8.40E-06	0.0011	0.005
Valves - Water/Lt. Oil	62	8,760	0.95	9.70E-06	0.0013	0.006
Connectors - Gas	868	8,760	0.63	1.00E-05	0.0120	0.052
Connectors - Light Oil	145	8,760	0.95	7.50E-06	0.0023	0.010
Connectors - Water/ Lt. Oil	145	8,760	0.95	1.00E-05	0.0030	0.013
Open-Ended Lines - Gas	10	8,760	0.63	1.50E-05	0.00021	0.00091
Open-Ended Lines - Light Oil	2	8,760	0.95	7.20E-06	0.000030	0.00013
Open-Ended Lines - Water/Lt. Oil	2	8,760	0.95	3.50E-06	0.000015	0.00006
Flanges - Gas	429	8,760	0.63	5.70E-06	0.00337	0.0148
Flanges - Light Oil	72	8,760	0.95	3.90E-07	0.000059	0.00026
Flanges - Water/Lt. Oil	72	8,760	0.95	2.90E-06	0.00044	0.0019
Other - Gas	78	8,760	0.63	1.20E-04	0.0129	0.057
Other - Light Oil	13	8,760	0.95	3.20E-05	0.0009	0.0038
Other - Water/Lt. Oil	13	8,760	0.95	5.90E-05	0.0016	0.0071
<b>TOTAL VOC EMISSIONS (tons/yr)</b>					<b>0.052</b>	<b>0.23</b>

GHG Fugitive Emissions									
Equipment Type	Number of Units	Hours of Operation (hours/yr)	Emission Factor <sup>1</sup> (kg/hr-unit)	CH <sub>4</sub> to THC Weight Fraction <sup>1</sup>	CO <sub>2</sub> to THC Weight Fraction <sup>1</sup>	THC Emissions (tpy)	CH <sub>4</sub> Emissions (tpy)	CO <sub>2</sub> Emissions (tpy)	CO <sub>2e</sub> Emissions (tpy)
Valves - Gas	371	8,760	2.50E-05	0.20	0.0081	0.090	0.018	0.00072	0.45
Valves - Light Oil	62	8,760	8.40E-06	0.010	0.0017	0.0050	0.000051	0.0000088	0.0013
Valves - Water/Lt. Oil	62	8,760	9.70E-06	0.010	0.0017	0.0058	0.000059	0.000010	0.0015
Connectors - Gas	868	8,760	1.00E-05	0.20	0.0081	0.084	0.017	0.00068	0.42
Connectors - Light Oil	145	8,760	7.50E-06	0.010	0.0017	0.011	0.00011	0.000018	0.0027
Connectors - Water/ Lt. Oil	145	8,760	1.00E-05	0.010	0.0017	0.014	0.00014	0.000024	0.0036
Open-Ended Lines - Gas	10	8,760	1.50E-05	0.20	0.0081	0.0015	0.00029	0.000012	0.0073
Open-Ended Lines - Light Oil	2	8,760	7.20E-06	0.010	0.0017	0.00014	0.0000014	0.00000024	0.000036
Open-Ended Lines - Water/Lt. Oil	2	8,760	3.50E-06	0.010	0.0017	0.000068	0.00000069	0.00000012	0.000017
Flanges - Gas	429	8,760	5.70E-06	0.20	0.0081	0.024	0.0048	0.00019	0.12
Flanges - Light Oil	72	8,760	3.90E-07	0.010	0.0017	0.00027	0.0000028	0.00000047	0.000070
Flanges - Water/Lt. Oil	72	8,760	2.90E-06	0.010	0.0017	0.0020	0.000021	0.0000035	0.00052
Other - Gas	78	8,760	1.20E-04	0.20	0.0081	0.091	0.018	0.00073	0.46
Other - Light Oil	13	8,760	3.20E-05	0.010	0.0017	0.0040	0.000041	0.0000070	0.0010
Other - Water/Lt. Oil	13	8,760	5.90E-05	0.010	0.0017	0.0074	0.000075	0.000013	0.0019
<b>Total Emissions (tons/yr)</b>						<b>0.34</b>	<b>0.059</b>	<b>0.0024</b>	<b>1.47</b>

1) Gas weight fractions from a representative gas analysis and liquid weight fractions from a representative flash gas analysis.

2) Emission Factors from EPA's 1995 Protocol for Equipment Leak Emission Estimates (EPA-453/R-95-017) Table 2-8 for emission factors < 10,000 ppmv as a leak detection and repair program will be implemented per NSPS OOOOa.

$$\text{VOC Emissions (lb/hr)} = \text{Emission Factor (kg/hr-unit)} * \text{Number of Units} * 2.205 \text{ lb/kg} * \text{VOC Wt. Fraction}$$

$$\text{VOC Emissions (tons/yr)} = \frac{\text{VOC Emissions (lb/hr)} * 8,760 \text{ hours/yr}}{2,000 \text{ lbs/ton}}$$

Heavy Oil < 20 API Gravity, Light Oil >= 20 API Gravity

Other equipment may include compressors, diaphragms, drains, dump arms, hatches, instruments, meters, pressure relief valves, polished rods, vents and pneumatic devices.

Number of components estimated from 40 CFR Part 98, Subpart W, Tables W-1B and W-1C

## Natural Gas-Fueled Heater Emissions

Company:	SHD Oil & Gas, LLC
Facility Name:	Old 7 Inch CTB
Location:	McLean County, North Dakota
Source Description	Heater Treater Unit (HT-001 - HT-013)

### Source Information

Unit ID	Heater Treater (HT-001 - HT-013)	
Hours of Operation (hrs/yr)	8,760	hr/yr
No. of Heaters	13	
Design Heat Rate	1.00	MMBtu/hr-heater
Site Heat Rate	1.00	MMBtu/hr-heater
Fuel Heat Value (Btu/scf)	1,825	Btu/scf
Fuel Use (MMscf/yr)	4.80	MMscf/yr-heater

### Emission Calculations

Pollutant	Emission Factor (lb/MMscf)	Estimated Emissions (tpy)	Emission Factor Source
NO <sub>x</sub>	100	5.58	AP-42 Ch. 1.4 Table 1.4-1
CO	84	4.69	AP-42 Ch. 1.4 Table 1.4-1
VOC	5.5	0.31	AP-42 Ch. 1.4 Table 1.4-2
PM 10	7.6	0.42	AP-42 Ch. 1.4 Table 1.4-2
HAPs	1.88	0.10	AP-42 Ch. 1.4 Table 1.4-3
SO <sub>2</sub>	0.60	0.033	AP-42 Ch. 1.4 Table 1.4-2
Pollutant	Emission Factor (kg/MMBtu)	Emissions (tpy)	Emission Factor Source
Carbon Dioxide	53.06	6,676.93	40 CFR Part 98, Subpart C, Table C-1
Methane	0.0010	0.13	40 CFR Part 98, Subpart C, Table C-2
Nitrous Oxide	0.00010	0.013	40 CFR Part 98, Subpart C, Table C-2
CO <sub>2</sub> e	--	6,683.83	40 CFR Part 98, Subpart A, Table A-1

### Sample Calculations:

$$\text{Fuel Consumption (MMscf/yr)} = \frac{\text{Heater Size (MMBtu/hr)} * \text{Hours of Operation (hrs/yr)}}{\text{Fuel Heat Value (Btu/scf)} * \text{Heater Efficiency}}$$

$$\text{Pollutant Emissions (tons/yr)} = \frac{\text{AP-42 Emission Factor (lbs/MMscf)} * \text{Fuel Consumption (MMscf/yr-heater)} * \text{Fuel heating Value (Btu/scf)} * \text{Number of Heaters}}{2,000 \text{ (lbs/ton)} * 1,000 \text{ (Btu/scf - Standard Fuel Heating Value)}}$$

## Natural Gas Composition

Company:	SHD Oil & Gas, LLC
Facility Name:	Old 7 Inch CTB
Location:	McLean County, North Dakota

Fuel Type:      **Field Natural Gas**  
 Heat Value (wet)<sup>1</sup>:      **1825**      **Btu/scf**  
  
 C1-C2 Wt. Fraction:      **0.35**  
 VOC Wt. Fraction:      **0.59**  
 Non-HC Wt. Fraction:      **0.055**  
 Total:      **1.00**

COMPONENT	MOLE PERCENT <sup>2</sup>	COMPONENT MOLE WEIGHT (lb/lb-mole)	NET MOLE WEIGHT (lb/lb-mole)	WEIGHT FRACTION
Methane	39.58	16.04	6.35	0.19
Ethane	18.32	30.07	5.51	0.16
Propane	18.27	44.10	8.06	0.24
i-Butane	2.36	58.12	1.37	0.041
n-Butane	7.92	58.12	4.60	0.14
i-Pentane	1.55	72.15	1.12	0.033
n-Pentane	2.46	72.15	1.77	0.053
Hexanes+	3.30	86.12	2.84	0.085
Nitrogen	5.66	28.01	1.59	0.047
Carbon Dioxide	0.58	44.01	0.26	0.0076
Hydrogen Sulfide	0.00	34.08	0.00	0.00
<b>TOTAL</b>	<b>100.00</b>		<b>33.47</b>	<b>1.00</b>

1) The fuel heating value is from a representative laboratory analysis.

2) The fuel gas composition is from a representative laboratory analysis.

$$\text{Relative Mole Weight (lb/lb-mole)} = [ \text{Mole Percent} * \text{Molecular weight (lb/lb-mole)} ] / 100$$

$$\text{Weight Fraction} = \text{Net Mole Weight} / \text{Total Mole Weight}$$

# Tank Vent Flash Gas Analysis

	Average Mol %	Component MW	Average Component Weight (lb/lb-mol)	Average Wt. Fraction
Methane	4.17	16.04	0.67	0.010
Ethane	7.97	30.07	2.40	0.036
Propane	19.86	44.10	8.76	0.13
i-Butane	5.65	58.13	3.28	0.049
n-Butane	15.31	58.12	8.90	0.13
i-Pentane	5.02	72.15	3.62	0.054
n-Pentane	9.15	72.15	6.60	0.099
Hexanes	5.30	86.18	4.56	0.069
Heptanes	6.56	100.2	6.57	0.099
Octanes	3.04	114.2	3.47	0.052
Nonanes	2.75	128.3	3.52	0.053
Decanes+	4.02	142.3	5.73	0.086
n-Hexane	2.81	86.18	2.42	0.036
Benzene	1.52	78.11	1.19	0.018
Toluene	1.64	92.14	1.51	0.023
Ethylbenzene	0.72	106.17	0.77	0.011
Xylenes	1.72	106.17	1.82	0.027
Nitrogen	2.55	28.01	0.71	0.011
Carbon Dioxide	0.26	44.01	0.11	0.0017
Totals	100.00		66.62	1.00

Molecular weight	66.62
Heat Content	3,522
Gas to Oil Ratio	39.00

VOC weight fraction	0.94
Methane weight fraction	0.010
THC weight fraction	0.99
VOC of THC wt fraction	0.95
Methane of THC wt fraction	0.010
Benzene of THC wt fraction	0.018
Toluene of THC wt fraction	0.023
E-benzene of THC wt fraction	0.012
Xylene of THC wt fraction	0.028
n-Hexane of THC wt fraction	0.037

1. Representative flash gas analysis from a nearby well.

## **Attachment D. Regulatory Discussion**

## Federal Regulation Applicability

### *40 CFR Part 60 – Standards of Performance for New Stationary Sources*

1. *Subpart Kb - Standards of Performance for Volatile Organic Liquid Storage Vessels (Including Petroleum Liquid Storage Vessels) for Which Construction, Reconstruction, or Modification Commenced After July 23, 1984.*

Applicability: Subpart Kb applies to volatile organic liquid storage tanks with a capacity greater than or equal to 75 m<sup>3</sup> (§60.110b(a)). However, Subpart Kb does not apply to storage vessels with a design capacity less than or equal to 1,589.874 m<sup>3</sup> that are used for petroleum or condensate storage prior to custody transfer. The 1,000 barrel oil and produced water storage tanks at the Old 7 Inch CTB will be greater than 1,589.874 m<sup>3</sup>, but will be used for storage prior to custody transfer. The 400 barrel oil and produced water tanks at the Old 7 Inch CTB will be less than 1,589.874 m<sup>3</sup>. Therefore, Subpart Kb does not apply to the Old 7 Inch CTB.

2. *Subpart JJJJ - Standards of Performance for Stationary Spark Ignition Internal Combustion Engines*

Applicability: Subpart JJJJ applies to engines that were ordered after June 12, 2006 and manufactured on or after July 1, 2008 for engines with maximum power less than 500 hp (§60.4230(a)(4)(iii)). There are no engines intended for the Old 7 Inch CTB, thus Subpart JJJJ does not apply.

3. *Subpart OOOO - Standards of Performance for Crude Oil and Natural Gas Production, Transmission, and Distribution*

Applicability: Subpart OOOO applies to facilities that were constructed, modified, or reconstructed after August 23, 2011 and on or before September 18, 2015 (§60.5365). Subpart OOOO applies to gas well affected facilities, which is a single natural gas well (§60.5365(a)). The Old 7 Inch CTB and the wells that produce to it will be constructed after September 18, 2015 and, therefore, are not subject to Subpart OOOO.

4. *Subpart OOOOa – Standards of Performance for Crude Oil and Natural Gas Facilities for which Construction, Modification, or Reconstruction Commenced after September 18, 2015*

Applicability: Subpart OOOOa applies to facilities constructed, modified, or reconstructed after September 18, 2015. All of the wells that produce to the Old 7 Inch CTB will be hydraulically fractured after September 18, 2015 and are, therefore, subject to Subpart OOOOa. The fugitive components at Old 7 Inch CTB are subject to Subpart OOOOa as defined in 60.5430a. Each storage tanks federally enforced controlled emissions are estimated to be less than 6 tons per year of VOC emissions and are therefore, the provisions under 60.5395a do not apply. The provisions under 60.5397a for a wellsite apply as the Old 7 Inch CTB meets this definition.

**40 CFR Part 61 – National Emission Standards for Hazardous Air Pollutants**

1. *Subpart V – National Emission Standard for Equipment Leaks (Fugitive Emission Sources)*

Applicability: Subpart V applies to components such as compressors, valves, and pumps that are intended to operate in volatile hazardous air pollutant (VHAP) service (§61.240(a)). VHAP service means that a component contains or contacts a fluid that is at least 10 percent by weight a VHAP. Subpart V does not apply to the Old 7 Inch CTB because none of the components will have fluid (natural gas, water, or condensate) that is over 10 percent by weight of any VHAP based on the representative gas analysis used in the emission calculations of Attachment C.

**40 CFR Part 63 – National Emission Standards for Hazardous Air Pollutants for Source Categories**

1. *Subpart HH – National Emission Standards for Hazardous Air Pollutants from Oil and Natural Gas Production Facilities*

Applicability: Subpart HH applies to oil and natural gas production facilities that are a major or area source of HAP emissions, and that process, upgrade, or store hydrocarbon liquids or natural gas prior to the transmission and storage source category (§63.760(a)). Subpart HH does not apply to the Old 7 Inch CTB, as there are no dehydration units intended for the site.

2. *Subpart HHH – National Emission Standards for Hazardous Air Pollutants from Natural Gas Transmission and Storage Facilities*

Applicability: Subpart HHH applies to natural gas transmission and storage facilities that are a major source of HAP emissions (§63.1270(a)). Subpart HHH does not apply to the Old 7 Inch CTB as it will be prior to the gas transmission and storage phase.

3. *Subpart EEEE – National Emission Standards for Hazardous Air Pollutants: Organic Liquids Distribution (Non-Gasoline)*

Applicability: Subpart EEEE applies to organic liquids distribution operations that are located at major source of HAP emissions (§63.2334(a)). Subpart EEEE does not apply to the Old 7 Inch CTB as it is not a major source of HAP emissions.

4. *Subpart ZZZZ - National Emission Standards for Hazardous Air Pollutants for Stationary Reciprocating Internal Combustion Engines*

Applicability: Subpart ZZZZ applies to stationary RICE at a major or area source of HAP emissions (§63.6585). There are no engines intended for the Old 7 Inch CTB and therefore, Subpart ZZZZ does not apply.

5. *Subpart DDDDD – National Emission Standards for Hazardous Air Pollutants for Industrial, Commercial, and Institutional Boilers and Process Heaters*

Applicability: Subpart DDDDD applies to process heaters at a major source of HAP emissions (§63.7485). Subpart DDDDD does not apply to the Old 7 Inch CTB as it is not a major source of HAP emissions.

## Air Quality Review

The location of the Old 7 Inch CTB is in McLean County on the Fort Berthold Reservation of North Dakota, approximately 50 miles southeast of Williston. The land is largely undeveloped, with minimal vegetation. The area is considered to be rural with relatively flat terrain and not significantly greater than the well pad elevation.

The Old 7 Inch CTB is located in a semi-arid climate. Climate measurements retrieved from the WRCC at Parshall, North Dakota, located 15 miles northeast of the Old 7 Inch CTB, were averaged from 1948 through 1979 monthly data. The data indicates that temperatures range from 5.3 degrees Fahrenheit to 68.6 degrees Fahrenheit annual, with average precipitation at 1.34 inches and annual snowfall at 22.2 inches. The predominate wind direction varies throughout the year. Average wind speed varies mildly between seasons, with the annual average wind speed varying from 9.5 miles per hour to 10.9 miles per hour from 1996 to 2014.

Actual emissions from the Old 7 Inch CTB are calculated to be less than major source thresholds. Considering the remote location and distance to nearby populations in Bismarck and Williston, fairly stable winds of the area, and emissions from the Old 7 Inch CTB, the impacts of the Old 7 Inch CTB are expected to be minimal on the overall air quality and ambient air.

### Endangered Species Act

Per the guidance from the instructions of Form NEW, the U.S. Fish and Wildlife Service's Endangered Species website was researched for McLean County, North Dakota. The following species were listed:

1. Whooping Crane
2. Piping Plover
3. Least Tern
4. Red Knot
5. Pallid Sturgeon
6. Dakota Skipper
7. Northern Long-Eared Bat

The impacts of the Old 7 Inch CTB on endangered and threatened species were addressed and evaluated as part of the Application for Permit to Drill (APD).

### National Historic Preservation Act

Per the guidance from the instructions of Form NEW, the National Park Service's National Register of Historic Places website was researched for historic places in McLean County, North Dakota. The following location search results are listed in the table below along with their relative distance to the Old 7 Inch CTB (referred to as Facility).

<b>Historic Places Results</b>	<b>Relative Distance to Facility</b>
Former McLean County Courthouse	~67 miles southeast of Facility
Holy Trinity Ukrainian Greek Orthodox Church	~81 miles southeast of Facility
Ingersoll School	~64 miles southeast of Facility
McLean County Courthouse	~66 miles southeast of Facility
Semevolos Farm	~77 miles east of Facility
Soo Line Depot	~55 miles northeast of Facility
Zion Lutheran Cemetery, Wrought-Iron Cross Site	~75 miles southeast of Facility

The impacts of the Old 7 Inch CTB on natural historic sites were addressed and evaluated as part of the APD.

**Attachment E.**  
**Monitoring, Recordkeeping, Reporting, and**  
**Testing Plan**

The following is a summary of the monitoring, testing, recordkeeping, and reporting procedures to demonstrate and assure compliance with the emission limitations for the Old 7 Inch CTB. These emission limitations relate to the flares used for oil and produced water storage tank emissions control.

### Operational Requirements

1. The flares used for oil and produced water storage tank emissions control will achieve 98 percent destruction efficiency, will operate at all times that gas is vented to it, will have a flame present at all times, and will have no visible emissions other than for periods not to exceed a total of 5 minutes during any 2 consecutive hours.
2. The flares will be operated per manufacturer instructions.
3. Storage tanks will be covered and routed through a closed vent system to the flares with no detectable emissions.

### Monitoring and Testing Requirements

1. Method 22 observations of flares will be conducted quarterly for a minimum of 2 hours.
2. Quarterly olfactory, visual, and auditory inspections will be conducted on the oil and produced water storage tanks' closed vent and control system for leaks or defects that could result in emissions. Leaks will be repaired as soon as practicable.
3. The presence of the pilot flame will be continuously monitored by a thermocouple.

## Recordkeeping

1. Records will be kept for a minimum of 5 years.
2. Records of inspection, observations, preventive maintenance, malfunctions, and shutdowns will be kept.
3. Records of the date, time, duration of each time that a flame is not present at the flares will be kept.
4. Records of startup, shutdown, and malfunctions of the flares will be kept.

## Reporting Requirements

1. Reports of deviance will be submitted to the Environmental Protection Agency (EPA) Region 8 within 21 days of discovery, per the EPA Audit Policy.

# **Attachment F. Supporting Documentation**

# ASTRO-CHEM LAB, INC.

4102 2nd Ave. West

Williston, North Dakota 58802-0972  
P.O Box 972

Phone: (701) 572-7355

## NATURAL GAS ANALYSIS

Sample Number: G-15-10331

Date of Analysis: 12/18/2015

Company: SHD Oil & Gas

Temperature: °F

Well Number: Golden 22-31H

Date Sampled: 11/19/2015

Pressure: PSI

Sample Source:

Sampled By: Sam Brown

Type of Analysis: GAS

Analysis By: B.Kyllo

Formation:

Interval:

Location:

Section:

Twp:

Rng:

County:

Distribution: Distribution List

COMPONENT	MOLE %	GPM
Nitrogen	5.66	0.000
Methane	39.58	0.000
Carbon Dioxide	0.58	0.000
Ethane	18.32	4.891
H2S	0.00	0.000
Propane	18.27	5.010
i-Butane	2.36	0.769
n-Butane	7.92	2.486
i-Pentane	1.55	0.564
n-Pentane	2.46	0.886
Hexanes+	3.30	1.445
Oxygen/Argon	0.00	0.000
Total	100.00	16.051

Calculated Specific Gravity 1.1660 (Air = 1.0000)

Calculated Gross BTU/ft3 1825 (Saturated) 1858 (Dry) at 14.73 psi and 60°F

Remarks:

# ASTRO-CHEM LAB, INC.

4102 2nd Ave. West

Williston, North Dakota 58802-0972  
P.O Box 972

Phone: (701) 572-7355

## NATURAL GAS ANALYSIS

Sample Number: G-15-10332

Date of Analysis: 12/18/2015

Company: SHD Oil & Gas

Temperature: °F

Well Number: Avalanche 36-17-TF2

Date Sampled: 12/15/2015

Pressure: PSI

Sample Source:

Sampled By: Sam Brown

Type of Analysis: GAS

Analysis By: B.Kyllo

Formation:

Interval:

Location:

Section:

Twp:

Rng:

County:

Distribution: Distribution List

COMPONENT	MOLE %	GPM
Nitrogen	2.34	0.000
Methane	58.38	0.000
Carbon Dioxide	0.71	0.000
Ethane	19.79	5.284
H2S	0.00	0.000
Propane	10.37	2.843
i-Butane	1.24	0.404
n-Butane	3.96	1.243
i-Pentane	0.79	0.287
n-Pentane	1.27	0.457
Hexanes+	1.15	0.504
Oxygen/Argon	0.00	0.000
Total	100.00	11.022

Calculated Specific Gravity 0.9149 (Air = 1.0000)

Calculated Gross BTU/ft3 1493 (Saturated) 1519 (Dry) at 14.73 psi and 60°F

Remarks:



GAS MEASUREMENT

EMISSIONS TESTING

LABORATORY

866.985.0866

www.Precision-Labs.com

## Flash Liberation of Hydrocarbon Liquid Study

**Client:** Nessel Consulting **Sample Lab ID:** 16032508-02  
**Site Name:** Golden Well **Analyst:** BR  
**Unique Number:** Not Indicated **Date Analyzed:** 02/23/16  
**Date Sampled:** 03/21/16  
**State:** ND **Site Notes:**  
**County:** Mountrail

### Flash Liberation of Hydrocarbon Liquid Conditions

	Pressure (psig)	Temperature (°F)
Separator Hydrocarbon Liquid	48.0	126.0
Stock Tank	0.0	70

### Base Conditions

	Pressure (psi)	Temperature (°F)
Base Conditions	14.73	60

### Flash Liberation of Hydrocarbon Liquid Results

Parameter	Result	Units/Description
Gas Oil Ratio	39	SCF flashed vapor/bbl stock tank oil
Gas Specific Gravity	2.309	Air = 1.000
Separator Volume Factor	1.013	Separator Volume/Stock tank Volume

### Stock Tank Fluid Properties

Parameter	Result	Units/Description
Shrinkage Recovery Factor	0.9877	Fraction of first stage separator liquid
Oil API Gravity at 60 °F	N/A	
Oil API Gravity, observed	N/A	at 74°F
Reid Vapor Pressure, psi	N/A	Absolute Pressure at 100°F by D5191

### Quality Control Summary

Duplicate Results	% Difference	Acceptable Range
Gas Oil Ratio	0.5	<5%
Separator Volume Factor	0.1	<5%
Shrinkage Recovery Factor	0.1	<5%
Cylinder Type	Piston	
Sample Collection Rate (mL/min)	50	<60

### Cylinder Pressure Check

	Pressure (psi)	Temperature (°F)
Sample Conditions	48.0	126.0
Test Sample	39.7	75.0



GAS MEASUREMENT

EMISSIONS TESTING

LABORATORY

866.985.0866

www.Precision-Labs.com

## Gas Evolved from Flashed Hydrocarbon Liquid

**Run File:** C:\Galaxie\data\16\_03\_31\16032508-011.DATA  
**Method:** S2\_ExtBTEX  
**Operator:** BR **Analysis Date:** 3/31/2016  
**Client:** Nasset Consulting **Date Sampled:** 2/23/2016  
**Site Name:** Golden Well **Purpose:** Flash Gas Analysis  
**Unique #:** Not Indicated **Pressure:** Ambient  
**Sample Temperature:** 70°F **Type Sample:** Spot  
**Sampled by:** BR **County:** Mountrail

COMPONENT	MOLE %	GPM
Hydrogen Sulfide	0.000	0.000
Nitrogen (N2)	2.548	
Carbon Dioxide	0.260	
Methane (CH4)	4.167	
Ethane (C2)	7.965	2.125
Propane (C3)	19.864	5.458
iso-Butane (i-C4)	5.648	1.843
Butane (C4)	15.307	4.813
iso-Pentane (i-C5)	5.023	1.832
Pentane (C5)	6.982	2.524
Hexanes	9.393	0.854
Heptanes Plus	22.843	13.298
Totals	100.000	32.749

Specific Gravity 2.309  
 Compressibility (Z) 0.9467  
 Molecular Weight 66.50

Saturated Ideal BTUs 3521.7 Saturated Real BTUs 3720.1  
 Dry Ideal BTUs 3584.1 Dry Real BTUs 3786.0

Base Conditions: 14.73 psi 60 °F

## Gas Evolved from Flashed Hydrocarbon Liquid Extended Analysis Report

COMPONENT	MOLE %	BTU	GPM	WT %
Hydrogen Sulfide	0.000	0.000	0.000	0.000
Nitrogen (N2)	2.548			1.073
Carbon Dioxide	0.260			0.172
Methane (CH4)	4.167	42.182		1.005
Ethane (C2)	7.965	141.280	2.125	3.601
Propane (C3)	19.864	500.954	5.458	13.172
iso-Butane (i-C4)	5.648	184.085	1.843	4.936
Butane (C4)	15.307	500.527	4.813	13.379
iso-Pentane (i-C5)	5.023	201.432	1.832	5.450
Pentane (C5)	6.982	280.528	2.524	7.575
2,2-Dimethylbutane	0.289	10.176	0.085	0.305
Cyclopentane	2.168	76.319	0.640	2.286
2,3-Dimethylbutane	0.434	15.264	0.128	0.457
2-Methylpentane	0.938	41.310	0.381	1.215
3-Methylpentane	0.552	24.324	0.225	0.715
n-Hexane	2.810	133.949	1.153	3.641
Methylcyclopentane	1.712	94.424	0.788	2.580
Benzene	1.518	54.622	0.423	1.783
Cyclohexane	1.371	57.429	0.465	1.735
2-Methylhexane	0.343	14.357	0.116	0.434
3-Methylhexane	0.490	20.510	0.166	0.620
2,2,4-Trimethylpentane	0.192	11.146	0.100	0.331
Other Heptanes (C7's)	2.853	157.374	1.313	4.300
n-Heptane	1.141	62.950	0.525	1.720
Methylcyclohexane	1.732	84.427	0.694	2.557
Toluene	1.642	70.318	0.548	2.275
Other Octanes (C8's)	1.849	115.808	0.945	3.176
n-Octane	0.996	62.358	0.509	1.710
Ethylbenzene	0.721	35.919	0.277	1.151
m,p-Xylene	1.436	71.368	0.557	2.293
o-Xylene	0.282	14.021	0.109	0.451
Other Nonanes (C9's)	1.784	125.108	1.001	3.441
n-Nonane	0.961	67.366	0.539	1.853
Other Decanes (C10's)	2.817	218.592	1.724	6.026
n-Decane	0.805	62.455	0.493	1.722
Undecanes (C11)	0.402	31.227	0.246	0.861
<b>Totals</b>	<b>100.000</b>	<b>3584.1</b>	<b>32.749</b>	<b>100.000</b>

Specific Gravity            2.309  
Compressibility (Z)        0.947  
Molecular Weight          66.500

Saturated Ideal BTUs        3521.7                      Saturated Real BTUs            3720.1

Dry Ideal BTUs                3584.1                      Dry Real BTUs                    3786.0

Base Conditions:              14.73 psi                                      60 °F

**TANKS 4.0.9d**  
**Emissions Report - Detail Format**  
**Tank Identification and Physical Characteristics**

**Identification**

User Identification:	Old 7 Inch CTB
City:	Williston
State:	North Dakota
Company:	SHD
Type of Tank:	Vertical Fixed Roof Tank
Description:	1 x 1,000-bbl Oil Tank

**Tank Dimensions**

Shell Height (ft):	30.00
Diameter (ft):	15.60
Liquid Height (ft) :	29.00
Avg. Liquid Height (ft):	15.00
Volume (gallons):	41,463.91
Turnovers:	18.59
Net Throughput(gal/yr):	770,739.67
Is Tank Heated (y/n):	N

**Paint Characteristics**

Shell Color/Shade:	Gray/Medium
Shell Condition	Good
Roof Color/Shade:	Gray/Medium
Roof Condition:	Good

**Roof Characteristics**

Type:	Cone
Height (ft)	1.00
Slope (ft/ft) (Cone Roof)	0.13

**Breather Vent Settings**

Vacuum Settings (psig):	-0.03
Pressure Settings (psig)	0.03

Meteorological Data used in Emissions Calculations: Williston, North Dakota (Avg Atmospheric Pressure = 13.82 psia)

**TANKS 4.0.9d**  
**Emissions Report - Detail Format**  
**Liquid Contents of Storage Tank**

**Old 7 Inch CTB - Vertical Fixed Roof Tank**  
**Williston, North Dakota**

Mixture/Component	Month	Daily Liquid Surf. Temperature (deg F)			Liquid Bulk Temp (deg F)	Vapor Pressure (psia)			Vapor Mol. Weight	Liquid Mass Fract.	Vapor Mass Fract.	Mol. Weight	Basis for Vapor Pressure Calculations
		Avg.	Min.	Max.		Avg.	Min.	Max.					
Crude oil (RVP 5)	All	49.69	39.44	59.95	44.51	2.3409	1.8900	2.8749	50.0000			207.00	Option 4: RVP=5

**TANKS 4.0.9d**  
**Emissions Report - Detail Format**  
**Detail Calculations (AP-42)**

**Old 7 Inch CTB - Vertical Fixed Roof Tank**  
**Williston, North Dakota**

<b>Annual Emission Calculations</b>	
Standing Losses (lb):	1,271.5425
Vapor Space Volume (cu ft):	2,930.7290
Vapor Density (lb/cu ft):	0.0214
Vapor Space Expansion Factor:	0.1611
Vented Vapor Saturation Factor:	0.3445
<b>Tank Vapor Space Volume:</b>	
Vapor Space Volume (cu ft):	2,930.7290
Tank Diameter (ft):	15.6000
Vapor Space Outage (ft):	15.3333
Tank Shell Height (ft):	30.0000
Average Liquid Height (ft):	15.0000
Roof Outage (ft):	0.3333
<b>Roof Outage (Cone Roof)</b>	
Roof Outage (ft):	0.3333
Roof Height (ft):	1.0000
Roof Slope (ft/ft):	0.1300
Shell Radius (ft):	7.8000
<b>Vapor Density</b>	
Vapor Density (lb/cu ft):	0.0214
Vapor Molecular Weight (lb/lb-mole):	50.0000
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	2.3409
Daily Avg. Liquid Surface Temp. (deg. R):	509.3644
Daily Average Ambient Temp. (deg. F):	41.4262
Ideal Gas Constant R (psia cuft / (lb-mol-deg R)):	10.731
Liquid Bulk Temperature (deg. R):	504.1792
Tank Paint Solar Absorptance (Shell):	0.6800
Tank Paint Solar Absorptance (Roof):	0.6800
Daily Total Solar Insulation Factor (Btu/sqft day):	1,217.5000
<b>Vapor Space Expansion Factor</b>	
Vapor Space Expansion Factor:	0.1611
Daily Vapor Temperature Range (deg. R):	41.0192
Daily Vapor Pressure Range (psia):	0.8949
Breather Vent Press. Setting Range (psia):	0.0600
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	2.3409
Vapor Pressure at Daily Minimum Liquid Surface Temperature (psia):	1.8900
Vapor Pressure at Daily Maximum Liquid Surface Temperature (psia):	2.8749
Daily Avg. Liquid Surface Temp. (deg R):	509.3644
Daily Min. Liquid Surface Temp. (deg R):	499.1096
Daily Max. Liquid Surface Temp. (deg R):	519.6192
Daily Ambient Temp. Range (deg. R):	24.7750
<b>Vented Vapor Saturation Factor</b>	
Vented Vapor Saturation Factor:	0.3445
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	2.3409
Vapor Space Outage (ft):	15.3333
<b>Working Losses (lb):</b>	
Working Losses (lb):	1,610.8961
Vapor Molecular Weight (lb/lb-mole):	50.0000
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	2.3409
Annual Net Throughput (gall/yr.):	770,739.6700
Annual Turnovers:	18.5882
Turnover Factor:	1.0000
Maximum Liquid Volume (gal):	41,463.8118
Maximum Liquid Height (ft):	28.0000
Tank Diameter (ft):	15.8000
Working Loss Product Factor:	0.7600
Total Losses (lb):	2,882.4387

**TANKS 4.0.9d**  
**Emissions Report - Detail Format**  
**Individual Tank Emission Totals**

**Emissions Report for: Annual**

**Old 7 Inch CTB - Vertical Fixed Roof Tank**  
**Williston, North Dakota**

Components	Losses(lbs)		
	Working Loss	Breathing Loss	Total Emissions
Crude oil (RVP 5)	1,610.90	1,271.54	2,882.44

**TANKS 4.0.9d**  
**Emissions Report - Detail Format**  
**Tank Identification and Physical Characteristics**

**Identification**

User Identification:	Old 7 Inch CTB
City:	Williston
State:	North Dakota
Company:	SHD
Type of Tank:	Vertical Fixed Roof Tank
Description:	1 x 400-bbl Oil Tank

**Tank Dimensions**

Shell Height (ft):	20.00
Diameter (ft):	12.00
Liquid Height (ft) :	19.00
Avg. Liquid Height (ft):	10.00
Volume (gallons):	16,074.56
Turnovers:	47.95
Net Throughput(gal/yr):	770,739.67
Is Tank Heated (y/n):	N

**Paint Characteristics**

Shell Color/Shade:	Gray/Medium
Shell Condition	Good
Roof Color/Shade:	Gray/Medium
Roof Condition:	Good

**Roof Characteristics**

Type:	Cone
Height (ft)	1.00
Slope (ft/ft) (Cone Roof)	0.17

**Breather Vent Settings**

Vacuum Settings (psig):	-0.03
Pressure Settings (psig)	0.03

Meteorological Data used in Emissions Calculations: Williston, North Dakota (Avg Atmospheric Pressure = 13.82 psia)

**TANKS 4.0.9d**  
**Emissions Report - Detail Format**  
**Liquid Contents of Storage Tank**

**Old 7 Inch CTB - Vertical Fixed Roof Tank**  
**Williston, North Dakota**

Mixture/Component	Month	Daily Liquid Surf. Temperature (deg F)			Liquid Bulk Temp (deg F)	Vapor Pressure (psia)			Vapor Mol. Weight	Liquid Mass Fract.	Vapor Mass Fract.	Mol. Weight	Basis for Vapor Pressure Calculations
		Avg.	Min.	Max.		Avg.	Min.	Max.					
Crude oil (RVP 5)	All	49.69	39.44	59.95	44.51	2.3409	1.8900	2.8749	50.0000			207.00	Option 4: RVP=5

**TANKS 4.0.9d**  
**Emissions Report - Detail Format**  
**Detail Calculations (AP-42)**

**Old 7 Inch CTB - Vertical Fixed Roof Tank**  
**Williston, North Dakota**

Annual Emission Calculations	
Standing Losses (lb):	644.8798
Vapor Space Volume (cu ft):	1,168.6725
Vapor Density (lb/cu ft):	0.0214
Vapor Space Expansion Factor:	0.1611
Vented Vapor Saturation Factor:	0.4382
Tank Vapor Space Volume:	
Vapor Space Volume (cu ft):	1,168.6725
Tank Diameter (ft):	12.0000
Vapor Space Outage (ft):	10.3333
Tank Shell Height (ft):	20.0000
Average Liquid Height (ft):	10.0000
Roof Outage (ft):	0.3333
Roof Outage (Cone Roof)	
Roof Outage (ft):	0.3333
Roof Height (ft):	1.0000
Roof Slope (ft/ft):	0.1700
Shell Radius (ft):	6.0000
Vapor Density	
Vapor Density (lb/cu ft):	0.0214
Vapor Molecular Weight (lb/lb-mole):	50.0000
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	2.3409
Daily Avg. Liquid Surface Temp. (deg. R):	509.3044
Daily Average Ambient Temp. (deg. F):	41.4282
Ideal Gas Constant R (psia cuft / (lb-mol-deg R)):	10.731
Liquid Bulk Temperature (deg. R):	504.1782
Tank Paint Solar Absorptance (Shell):	0.6800
Tank Paint Solar Absorptance (Roof):	0.6800
Daily Total Solar Insulation Factor (Btu/sqft day):	1,217.5000
Vapor Space Expansion Factor	
Vapor Space Expansion Factor:	0.1611
Daily Vapor Temperature Range (deg. R):	41.0192
Daily Vapor Pressure Range (psia):	0.8949
Breather Vent Press. Setting Range (psia):	0.0600
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	2.3409
Vapor Pressure at Daily Minimum Liquid Surface Temperature (psia):	1.8900
Vapor Pressure at Daily Maximum Liquid Surface Temperature (psia):	2.8749
Daily Avg. Liquid Surface Temp. (deg R):	509.3044
Daily Min. Liquid Surface Temp. (deg R):	499.1096
Daily Max. Liquid Surface Temp. (deg R):	519.6192
Daily Ambient Temp. Range (deg. R):	24.7750
Vented Vapor Saturation Factor	
Vented Vapor Saturation Factor:	0.4382
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	2.3409
Vapor Space Outage (ft):	10.3333
Working Losses (lb):	
Working Losses (lb):	1,276.3862
Vapor Molecular Weight (lb/lb-mole):	50.0000
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	2.3409
Annual Net Throughput (gall/yr.):	770,739.6700
Annual Turnovers:	47.9478
Turnover Factor:	0.7923
Maximum Liquid Volume (gal):	16,074.5628
Maximum Liquid Height (ft):	19.0000
Tank Diameter (ft):	12.0000
Working Loss Product Factor:	0.7600
Total Losses (lb):	1,921.2688

**TANKS 4.0.9d**  
**Emissions Report - Detail Format**  
**Individual Tank Emission Totals**

**Emissions Report for: Annual**

**Old 7 Inch CTB - Vertical Fixed Roof Tank**  
**Williston, North Dakota**

Components	Losses(lbs)		
	Working Loss	Breathing Loss	Total Emissions
Crude oil (RVP 5)	1,276.39	644.88	1,921.27